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Smallpox Diagnosis with Special Reference to Electron Microscopy

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NEW information relating to the field of viruses in general and variola-vaccinia virus in particular have provided a convenient opportunity for review of past and present laboratory diagnostic methods available for the identification of smallpox.

In suspected cases of infection, five different procedures have been commonly used and these are as follows: (1) Isolation of variola virus by the inoculation of infected human material in rabbits with production of characteristic lesions. (2) Cultivation of the virus in the chorio-allantoic membrane of the developing chicken embryo. (3) Use of the variola-vaccinia flocculation reactions. (4) Employment of the specific complement fixation test. (5) Use of the direct film scraping microscopic test for morphological evidence of Paschen elementary bodies. For complete bibliography, see van Rooyen and Rhodes (1948).

Technical data relating to the above may be summarized thus:

(1) Isolation of virus can be accomplished at any stage in the course of mild or severe smallpox provided that enough skin tissue can be gathered from the lesions manifest at the time. Material should be gathered in sterile receptacles, and emulsified in broth. It can be inoculated in one of a number of ways into young rabbits, such as by scarification of the cornea (Paul, 1919). A positive response is signified by the formation of acute kerato-conjunctivitis within 48 hours accompanied by the development of acidophilic intracytoplasmic Guarneri inclusion bodies in the epithelial cells of the cornea—evident

on histological section. With good facilities, Paul's test may take three or more days to perform. Defries and McKinnon (1928) performed the test in several cases of variola but abandoned it owing to the high percentage of negative histological results in obvious cases of smallpox; likewise van Rooyen and Illingworth (1944) rejected Paul's test for the same reason. The long time required to secure an answer was a further inconvenience. Better results have been obtained by direct inoculation of variolous human material into shaved rabbit skin as performed by McKinnon and Defries (1928), and in positive cases the development of a characteristic umbilicated pustule in 4-5 days was sufficient to establish a diagnosis. The slower and more laborious procedure of introducing suspected material in rabbit testis and thereafter attempting to isolate a strain of virus by serial transfer has also been tried, but it can scarcely be recommended as a routine diagnostic procedure.

(2) Recently, isolation of variola virus on the chorio-allantoic membrane of developing chicken embryo has been shown to be of practical value by Downie and Dumbell (1947), and Downie (1947). Infective human skin scrapings derived from suspected cases exhibiting the earliest signs of rash can be employed as a source of material. The egg cultivation method of Downie and Dumbell (1947) is infinitely superior to obsolete methods involving rabbit inoculation for identification and recovery of virus.

(3) The variola-vaccinia flocculation reaction (Gordon, 1925) may be performed with pustular or scab material. The latter is duly treated and employed as antigen to produce specific flocculation effects when added to antivaccinal serum. The test possesses the virtue of simplicity and is worthy of more attention.

(4) Specific complement fixation reactions employing variolous pustular and scab material as antigen have been used with great success in smallpox diagnosis at Dundee in Scotland by Craigie and Tulloch (1931) and in Canada by Craigie and Wishart (1936). The test is too well established to merit further comment. It demands a high standard of serological skill, the incorporation of proper controls, and the correct interpretation of finely balanced complement deviation effects.

(5) The direct skin scraping test, based on the microscopic finding of the elementary Paschen virus bodies in the early lesions of human variola, was extensively employed in Egypt by van Rooyen and Illingworth (1944). The advantages of the method are that it can be applied to any suspected smallpox prodromal rash at the very first signs of appearance. Moreover, the procedure entails a relatively simple staining technique, the results of which can be interpreted by any bacteriologist familiar with the appearance of virus elementary bodies. The entire operation from the time of scraping the patient's skin lesions to the final result should not occupy more than half an hour. A high percentage of cases of smallpox give a positive result in the early stages of infection but with the onset of pustulation and development of secondary bacterial contamination, appearances tend to become confusing.

Smallpox can also be differentiated from chickenpox by the direct film scraping test. The presence of elementary bodies in the early lesions of varicella has long been recognized by Paschen (1933) and Amies (1933).

Later inquiries by van Rooyen and Illingworth (1944) showed that the elementary bodies of variola were larger in size, stained more readily, and occurred more frequently in the lesion of variola than those of varicella. Continued investigations on cases of chickenpox occurring in England, Scotland, and Canada have amply confirmed this fact.

Thus, when material from suspected cases of variola is being examined, well-stained control known positive smears from typical cases of variola should always be available for comparison. Failure to observe this precaution will inevitably end in disaster.

PHASE-CONTRAST MICROSCOPY (ZERNIKE, 1934)

Recent developments in the application of this system to biological objects prompted us to try out this method. Accordingly, we employed a Spencer type instrument fitted with a 1.8 mm oil NA 1.25 of X96 immersion achromatic objective and built in 0.14A - 0.25 λ diffraction plate, also appropriate phase condenser and annular diaphragm.

A variety of preparations were inspected. These included stained and unstained smears from smallpox vesicle fluid, containing varying numbers of elementary bodies with a variable amount of tissue background. In good specimens stained by Paschen's method, elementary bodies exhibited a light green tinge and appeared to stand out in relief against the surrounding background. Where preparations contained much background and amorphous debris with scanty elementary bodies, the latter could be more readily identified than by direct illumination.

It would thus seem that the phase-contrast method may prove of additional value in facilitating identification when the appearance presented by a stained film is doubtful, but much further work is necessary before conclusions can be reached.

ELECTRON MICROSCOPY

Material from 5 cases of variola major was provided through the courtesy of Dr. E. S. Horgan of The Stack Laboratories, Khartoum, and Lt.-Col. Graves-Morris, Principal Medical Officer, British Military Authority, Tripolitania, North Africa.

Our experiments were designed to explore the value of the electron microscope as a tool for the practical diagnosis of smallpox in the field so as to evaluate the results with existing procedures.

Technique

From the first case, glass capillary tubes of vesicle fluid were obtained, placed in a hermetically sealed metal box, and forwarded to Toronto, where the specimens were examined two weeks after collection. A minute quantity of the exudate was placed on formvar-covered 200-mesh electron microscope mounts and allowed to dry; the entire inoculated mounts were thereafter immersed in a 0.2 per cent solution of crystalline trypsin (which probably contained traces of ammonium sulphate) and incubated for 4 hours at 37°C.

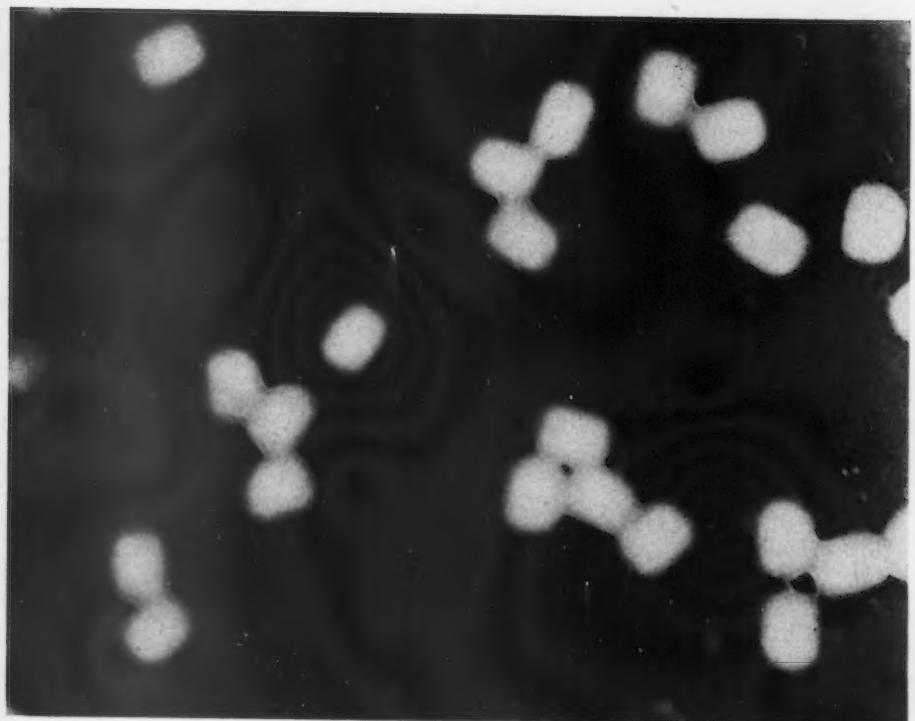
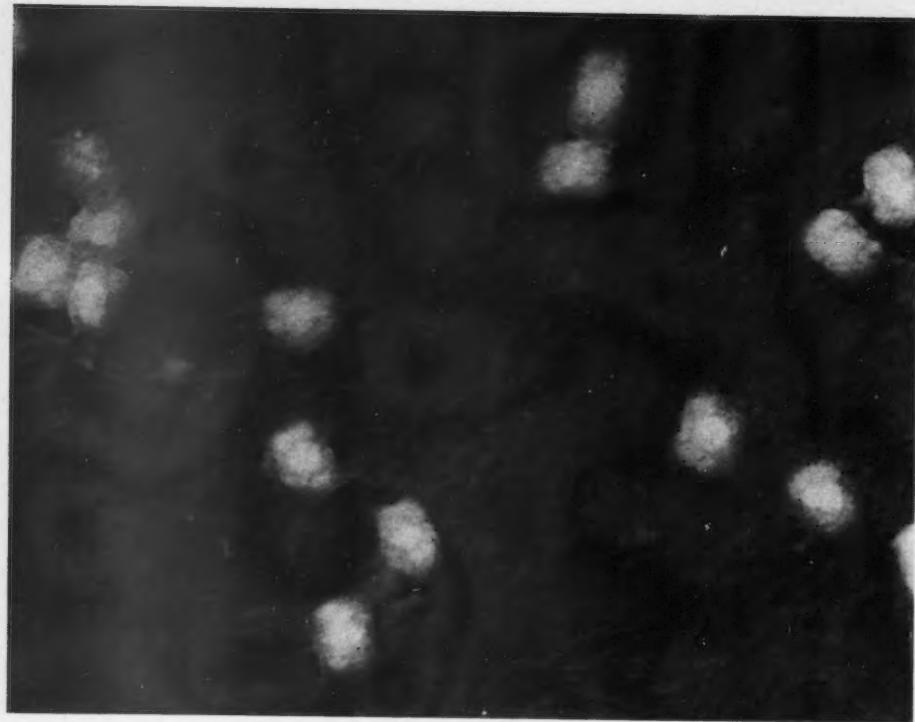


FIGURE 1
Vaccinia elementary bodies from a well-washed suspension prepared in the
laboratory from infected rabbit skin. Standardized shadowing technique.

FIGURE 2
As in no. 1, after shadowcasting. Observe large central area of greater
transparency.

Thereafter, the mounts were removed, washed with distilled water, and dried in air. Half the number of mounts were placed in the electron microscope, viewed and photographed on the screen at magnifications of X3,500 and X8,300. The remainder were shadowcast with 50 A.U. of chromium at an angle of 4:1 prior to subsequent photography.

Specimens from the four other cases were prepared in a different manner. Instead of requesting capillary fluid, we forwarded formvar mounts to Tripolitania where Capt. C. J. Radway, R.A.M.C., inoculated the mounts directly from the skin lesions at the patient's bedside. The mounts were made in Arab huts under great difficulties where, owing to the intense heat, it was not possible to employ even the most elementary refinement in technique, such as the use of a capillary pipette for transferring fluid. Thus mounts from these cases may be accepted as having been prepared under the crudest possible surroundings, and constituted an excellent trial of the mode of collecting of specimens. A further test was that, notwithstanding the physical deterioration of delicate formvar membrane, Capt. Radway's material was gathered in Misurata E province, Tripolitania, in April and was examined in Canada in August some months later. As before, mounts were treated with trypsin solution for 4 to 24 hours and photographed with an R.C.A. EMU, 40 KV electron microscope (fitted with objective diaphragm) before and after shadow-casting at low and high magnification.

Results

Mounts prepared in the laboratory from specimens of capillary fluid yielded superior results to those prepared in the field by direct inoculation. Nevertheless, even in the latter, clumps and masses of elementary bodies buried in a film of inspissated serum could be easily recognized at low-power magnification. Under higher power the morphology of individual elementary bodies was visible as brick-shaped structures measuring approximately 320μ by 250μ with a height of 130μ . Such variation in size as observed was more probably due to disposition of elementary bodies than to inherent differences.

Important points are that immediately after mounts are inoculated with infected vesicle fluid they should be allowed to dry and thereafter either well washed with distilled water, or treated with crystalline trypsin solution, and again washed with water or, better still, both procedures employed. When searching specimens, efforts should first be made to find clumps of virus particles under low power and thereafter under high power to identify single elementary bodies exhibiting characteristic rectangular-shaped outline with central area of greater electronic density.

Virus was identified in material from 4 out of 5 patients with ease. (See Figures 3, 4, 5, 6.)

Controls

The work of Green, Anderson, and Smadel (1942) and Dawson and McFarlane (1948) has clearly demonstrated the structure of vaccinia virus. Our own photographs of vaccinia virus (Figures 1 and 2) amply confirm these findings and indicate that the viruses of variola and vaccinia are morphologically indistinguishable.

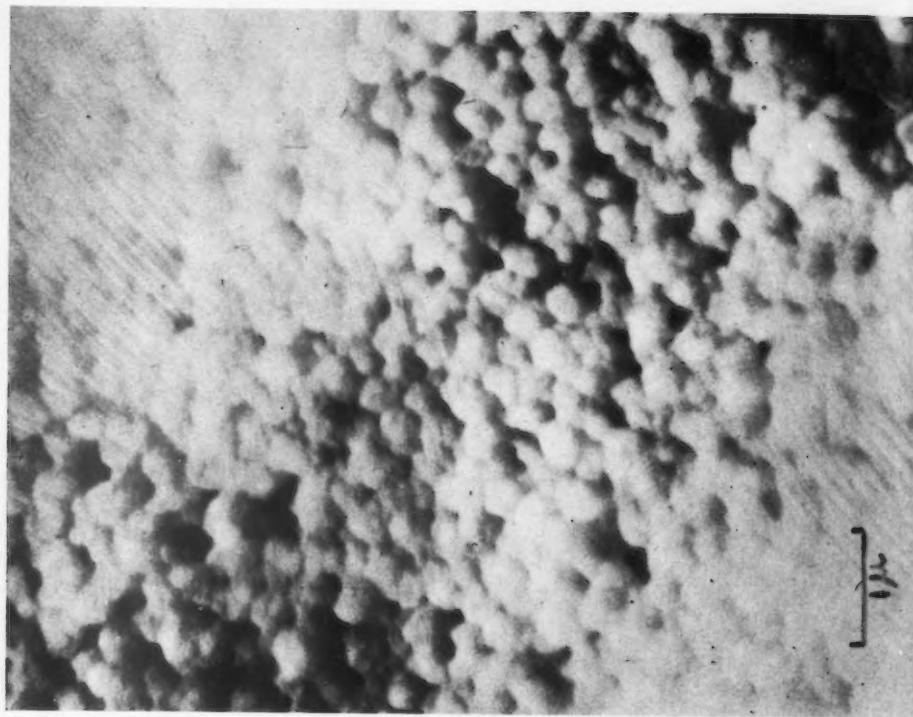


FIGURE 3

Variola elementary bodies from case of African smallpox. Observe the large mass of bodies suggestive of a complete Guarnieri inclusion body; shadowed.



FIGURE 4
An area of a just unroofed vesicle

The question of whether varicella virus can be confused with variola has been of special concern to us. Nagler and Rake (1948) have illustrated elementary bodies in cases of varicella which they reported to be smaller than the elementary bodies of variola. We, too, have searched carefully made mounts from many cases of varicella at all stages of the eruption. Our findings have been disappointing and we have so far failed to demonstrate anything but solitary and bizarre-shaped elementary bodies from cases of chicken pox.

**RELATIVE MERITS OF LABORATORY TESTS AND APPROPRIATE SPECIMENS
DESIRED FROM CASES OF SMALLPOX FROM THE FIRST TO FOURTEENTH
DAY OF ILLNESS**

Each method has advantages from the laboratory and clinical aspects, and the usefulness of each may be summarized thus: The choice of test depends on the stage of the disease at which infection is first suspected, and the nature of pathological material available for investigation.

The reader is reminded that in the typical uncomplicated case of variola the incubation period is 12 days. The sequence of dermatological changes is that the early prodromal "bathing-drawers" inguinal rash (if present) is usually evident on the second day of fever; the maculo-papular eruption occurs on the third day: vesiculation on the fourth to fifth day, followed by pustulation on the sixth to eighth day, and later by scab formation and desquamation from the ninth to the fourteenth day. Time is an important factor in the successful epidemiological control of variola. To attain a high pitch of efficiency in smallpox diagnosis, both clinician and bacteriologist should know what test to ask for, the nature of specimen desired, how material is to be gathered and transmitted to the laboratory, the approximate duration of each examination and, above all things, the fact that whereas a positive result is strong evidence in favour of smallpox, a single negative answer passes the immediate onus of responsibility for diagnosis to the clinician. Repeated negative reports are, however, of confirmatory value if the clinical diagnosis should warrant it.

Day I (Stage of Fever): No laboratory tests are possible.

Days II and III (Stage of Inguinal Rash): If the groins and buttocks of the patient are searched and characteristic distribution of early petechial rash of smallpox is found (it is often absent), the diagnosis can be confirmed beyond doubt in less than half an hour by examining skin scrapings for the presence of elementary bodies. Any form of prodromal rash can be scraped, whatever its distribution. The specimen is collected thus: A sterile sharp-pointed scalpel and three well-cleaned glass microscopic slides are required, with a bottle of ether and absolute alcohol. Choose a dozen typical petechiae, clean them with cottonwool soaked in ether; scrape the red central base of each lesion with the point of the knife and rub the exudate with a circular rotary motion over the surface of the slide. Four smears are made on each slide. Thereafter the preparations are allowed to dry in air for 10 minutes; treated with sterile distilled water for approximately 3 minutes; placed upright in a rack; allowed to dry; and flooded with a mixture of equal volume alcohol and ether for 3 minutes. The mixture is poured off, the slides are dried in



FIGURE 5
Micrograph from mount prepared under rough field conditions from case of smallpox in Tripolitania. Notwithstanding effect of drying due to great heat, elementary bodies are still recognizable as to size and shape, sufficient to establish a diagnosis; unshadowcast. $\times 35,000$.

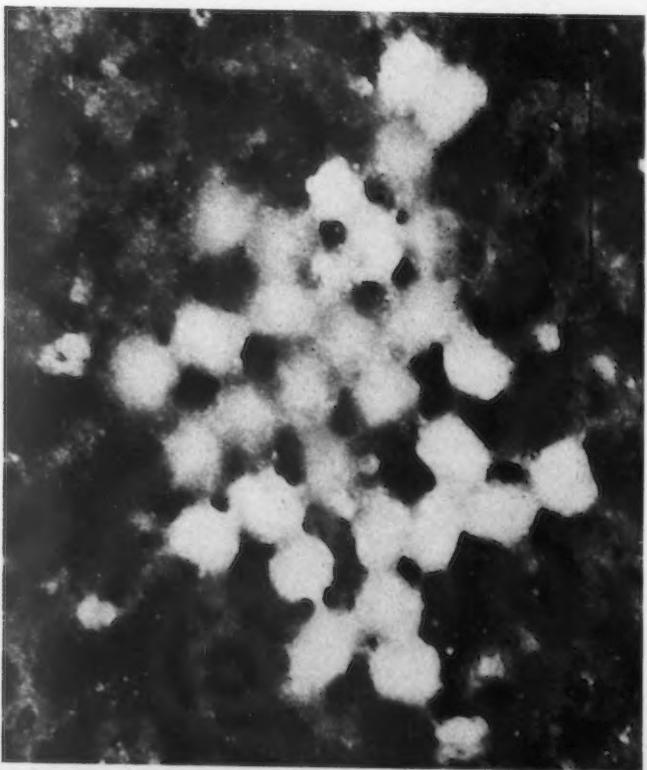


FIGURE 6
Variola elementary bodies from a third case of smallpox, in Tripolitania. Specimen as in no. 5 collected and mount prepared under field conditions. The morphology of the virus bodies is clearly recognizable; shadowcast. $\times 35,000$.

air, wrapped in clean paper and sent to the laboratory with the request that they be stained by Paschen's method and examined for presence of variola-vaccinia elementary bodies. The bacteriologist should be able to provide a reply within 30 minutes after receipt of the specimen. If virus is found, the case may safely be regarded as variola, but if no elementary bodies are visible, scrapings should be repeated every 4 hours as long as the clinical diagnosis remains uncertain.

Egg embryo inoculation. Skin lesions at any stage may be used. If fluid is present, it should be aspirated into sterile capillary tubes, or if scabs, be harvested into glass phials, and sent to the laboratory. The test should be performed on every suspected case of smallpox where the clinical diagnosis is in doubt. A major disadvantage of chick embryo inoculation is that embryos 10 to 12 days old may not be available when a case occurs. Growth may occur in 3 days, but more often it may take 7 days and at least two serial transfers before the pocks on the membrane can be identified as variola-vaccinia virus.

Paul's Test. The most efficient method for performing this test is to summon the bacteriologist to the patient's bedside. Scrape several lesions with a sterile scalpel, and with it scarify the cornea of an anaesthetised rabbit. The animal is returned to its cage; 48 hours later it is killed; the cornea excised; histological paraffin sections prepared, stained and examined for intracytoplasmic acidophilic Guarnieri inclusion bodies. The severest criticism of Paul's test is that it takes at least 3 days to perform, and in the average case of variola major or minor which pursues a normal course, the diagnosis is usually obvious when the result arrives. This same criticism applies to egg inoculation.

Serological Tests. Scrapings of infected skin epithelium or vesicle fluid are required. In the average case of smallpox such material is not present on the first, second and third days of illness.

Days IV and V (Stage of Vesiculation): The direct film scraping method can be performed and yields good results at this stage of the disease; even better results may be expected with electron microscopy. Isolation of virus is also possible. If vesiculation be well advanced, over 1 c.c. of fluid should be gathered into capillary tubes by puncturing several vesicles. The material is used as antigen for either the variola-vaccinia complement fixation or flocculation reactions. The test should be done at a laboratory familiar with the conduct of finely balanced serological tests and the interpretation of results, where a stock of essential antigen controls, such as chicken-pox crusts, vaccinia virus and antivaccinal serum, is ready for use at short notice. Both procedures occupy about 12-24 hours and are highly specific for variola.

Days VI to VIII (Stage of Pustulation): Pustulation is generally pronounced at this stage, and the introduction of streptococci, staphylococci, *B. coli*, other secondary contaminating organisms and artefacts makes it difficult to execute the direct film scraping technique. The value of electron microscopy at this stage is yet to be ascertained. By carefully selecting lesions containing clear fluid, scraping the red periphery of individual pocks, and avoiding the presence of serosanguineous pus, it is occasionally possible to obtain reasonably satisfactory preparations showing virus elementary bodies

enough to confirm the diagnosis. The author, however, does not advise the practice of this technique after the onset of pustulation. Chick embryo inoculation with the aid of penicillin can be carried out and vaccinia virus recovered by that method or by intratesticular inoculation of rabbits with pustule contents.

Serological tests offer the best prospect of arriving at a laboratory diagnosis after the fifth day of disease. As much pustular exudate as procurable should be gathered in a glass capillary tube, sealed with a flame, and sent to the laboratory.

Days IX to XIV (Stage of Desiccation and Desquamation): During the process of drying of the pustules followed by desquamation, serological tests offer the best prospects of securing laboratory evidence of infection. They are very suitable in missed cases of smallpox, seen for the first time late in the disease. From the patient and his garments, all available crusts and scabs should be picked off with forceps, placed in a dry, sterile, screw-cap glass phial, and transmitted to the laboratory. Crusts retain their infectivity for long periods of time and so an attempt to isolate virus should also be made. According to Nagler and Rake (1948), elementary bodies can be demonstrated by electron microscopy, in extracts prepared from smallpox crusts.

The above data can conveniently be epitomized in Table I.

TABLE I
A SUMMARY OF LABORATORY TESTS

Day of Illness	Clinical Condition	Material available Specimen required	Test to be Performed	Duration of Laboratory Examination
1	Fever, headache, backache	Nil	Nil	Nil
2	Petechial inguinal or othervariety of prodromal rash	Scrapings from skin petechiae on slides, also in 1 c.c. of saline	Electron and light micro. exam. for Paschen elementary bodies of variola. Isolation of vaccine virus by egg inoculation	30 minutes 3-7 days
3	Maculopapular eruption	as above	as above	as above
4 to 5	Vesicles	If vesicles are small, skin scrapings from the base of 6 or more lesions should be made on glass slides. If vesicles are large and contain much fluid, fill capillary tubes. Vesicle fluid in capillary tubes	Electron and light micro. exam. for Paschen bodies as above, also variola-vaccinia complement fixation reaction if 1 c.c. or more fluid is procurable. Isolation of virus by egg embryo and rabbit inoculation	30 minutes 12-24 hours 3-7 days
6 to 8	Pustules	Exudate from pustules to be collected in sterile screw-cap phial	Complement-fix. test. Flocculation reaction. Isolation of virus by egg or rabbit inoculation	12-24 hours 12-24 hours 3-7 days
9 to 14	Scabs	Desquamated epithelium to be gathered in a dry, sterile screw-cap phial	as above	as above

SUMMARY

Smallpox laboratory diagnostic methods have been reviewed, and the merits of each in relation to clinical stages of the illness are explained. Attention has been drawn to the claims of the electron microscope as a useful tool for the rapid and early diagnosis of smallpox.

ACKNOWLEDGMENTS

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Canada's National Health Program

A PROGRESS REPORT

THE HONOURABLE PAUL MARTIN
Minister of National Health and Welfare
Ottawa, Canada

CANADA'S HEALTH SERVICES rest firmly on the foundations that the physicians of Canada have laid. Government action cannot supplant your enthusiasms or your effectiveness. The first essential of any government health program is to strengthen the hands of those most immediately responsible for health leadership.

The first point in my progress report is to note that the new national plan does not in any way lessen the role or lighten the responsibilities of the individual doctor, dentist, nurse or health worker. In bringing better health to its citizens, a government must look to your profession for leadership. Without your confidence and collaboration, no health program could be fully successful. I can assure you that no action taken by the present Government under this or under any other program to improve health services in Canada will stifle or destroy the liberty of the individual doctor. All of us in our own respective fields must, of course, recognize our social responsibilities in the service of society, whether we be public servants, or professional persons in the larger areas of service to humanity. We must adjust our disciplines, our patterns of performance, in recognition of this growing sense of social responsibility. Yet this must be accomplished without restriction of our liberty and freedom. Health advances take their inspiration from the imagination, industry and integrity of each member of your profession. Regimentation of the doctor would be ruinous to health progress. In any sensible health plan the doctor holds a responsible position. Will we not want to see that doctors should continue to be free to serve their patients—not that they should become mere servants of the state?

THE PROVINCES AND THE FEDERAL PROGRAM

The second point in my progress report is that the national health program does not lessen the momentum of provincial health services. Our program for health must start with the individual citizen. In taking account of all his working and living conditions, health planning can best be done on a local or regional basis. Except for long-established federal health services—such as the inspection of food and drugs, quarantine, and health care for sick mariners and Indians—it would be folly to attempt to administer from Ottawa all Canada's far-flung health activities.

*Presented at the annual dinner of the Royal College of Physicians and Surgeons of Canada,
held in the Chateau Laurier Hotel, Ottawa, on November 27, 1948.*

While health is a national concern, it is primarily a provincial responsibility. And rightly so. Our health services are soundly established in each province; as they are based in large part on local need and related to local conditions, they should be administered locally and provincially. This is as sound as it is sensible. Health administration in Canada is a vastly complex inter-locking system of the multiple activities of voluntary health agencies and of the municipal, provincial and federal governments.

If, in trying for an illusionary efficiency, we pressed for an overall central administration, we could only confuse the health picture. Such centralization would badly serve the Canadian citizen. Our federal plan does not disturb the proper Dominion-Provincial balance of health services. It does not attempt to do ponderously for the provinces what they can do efficiently for themselves. There are, however, important health duties incumbent on every government in Canada. Through the Department that I have the honour to administer, the Federal Government has a clear responsibility—apart from its own health services—to cooperate with provincial authorities in the co-ordination of efforts to improve the public health of Canada. In recognition and in discharge of this responsibility, the national health program was inaugurated.

THE PROGRAM IN OUTLINE

Before going into detail of results achieved, I shall review the major objectives of this program and the provisions made to reach them:

1. *Comprehensive and searching surveys are to be made of the Canadian health scene.* Each province is given financial assistance to make a close study of its health services and of its hospital needs, and to formulate its health plans for the future. For this purpose, federal grants totalling \$625,000 have been provided.

2. *Provincial health services are to be strengthened and extended.* New developments are to be encouraged. There will be concerted campaigns to widen the range of preventive medicine and to cure disease. Federal grants starting at \$16,500,000 and rising to \$22,000,000 will be available each year for public health research, for public health projects, to train professional health workers, to help crippled children, to fight venereal disease, to control tuberculosis and cancer, and to manage mental illness.

3. *Great increases in hospital accommodation are to be encouraged by annual grants to the provinces, totalling \$13,000,000 a year.* In order to provide a powerful incentive towards building 40,000 badly needed hospital beds, the Government will pay up to \$65,000,000 over a period of five years, at the rate of either \$1,000 or \$1,500 for each bed—on condition that the provinces match these grants.

In recent years the Federal Government has widely surveyed the Canadian health scene. Everywhere it found evidence of real achievement. The provinces have been doing admirable work, increasing their health service and hospital facilities, but it was seen that, if the pace of their health progress was to be accelerated and neglected areas cared for, federal financial aid was essential.

PROGRESS REPORT ON NATIONAL HEALTH

It is only four months since this program got under way, but already there is every evidence that it is succeeding admirably in its main purpose—to raise the entire level of health activity in Canada. From every province plans and projects are coming into Ottawa. During the past ten days, for example, the number of such requests has varied from 10 to 37 a day. It is an inspiration to receive, from all parts of Canada, details of projects that reflect the imagination and initiative of provincial health departments, eager to take full advantage of this federal assistance to expand their present services and to strike out in new directions.

From the projects coming to us it is evident that each province is carefully reviewing its health operations, while searching out and training personnel for the new activities planned. New equipment is being sought, administrative machinery is being expanded; weak points in provincial programs are being searched out and corrected. Neglected territory is being brought within the orbit of these new health plans.

It takes time to assess and strengthen provincial programs and this might prevent full and immediate use of the moneys available. When I asked Parliament to approve the whole amount for this fiscal year, I did so for a special purpose—to indicate how anxious the Government was to see its grants fully utilized this year if possible. This year's allotment of \$30,000,000 is our target figure—the amount of money that we believe should be expended to bring our health services up to desirable levels. While all of the health survey grant and much of the national health grant moneys will be expended in this fiscal year, it seems possible that some provinces will be unable to use all of their hospital construction grants. So, to achieve the results desired, the Government will carry over the unexpended portion of the hospital construction grants to make a total of \$65,000,000 available by 1953 to increase hospital accommodation.

(a) *Health Survey Grants*

First of all, it is encouraging to see the energy that is being put into the provincial health surveys. *Planning shows the way to health progress.* At a three-day conference held this week in Ottawa, the directors of all these survey groups showed a determination to get at the facts about their health services and hospital facilities and to search out remediable conditions. They were assisted by the newly formed National Consultative Committee, made up of representatives of the principal national professional associations. In every province, health services and hospital accommodation are being reassessed and related to present and future needs, especially in view of the federal support now at hand. The national health program was based on the best information and the best advice available but the provincial health surveys will provide an additional mass of accurate and useful information from which further health advances can be more easily planned.

(b) *Hospital Construction Grants*

The necessity of completing preliminary surveys of their needs has, until recently, prevented some of the provinces from putting forward their

programs for hospital construction grants, but Nova Scotia, New Brunswick, and Manitoba have made important requests for federal aid. These are now under consideration. I am expecting submissions from Ontario and Quebec in a few days. In spite of the difficulties that delay construction work of any sort in Canada, great importance is attached to helping the provinces increase their hospital accommodation by 40,000 beds in the next five years. We will encourage every province that finds it impossible to utilize its full grant in the first year to expand its building program in subsequent years to use the available federal grant—that can be carried over each year—in order to build the accommodation so urgently needed.

(c) *National Health Grants*

There can be little doubt that even in the few months that have passed notable advances have been initiated through the National Health Grants. In reviewing each grant I shall attempt to illustrate by typical examples—chosen from scores of projects—the sort of activities that are now under way.

(1) *To Underwrite Research in Public Health*

In the present year, \$100,000 has been set aside for research in public health, in addition to the funds provided through the National Research Council. Projects are shaping up to make good use of this money. As research facilities and trained personnel are augmented, this grant will rise to \$500,000 annually. The need for research is fully recognized throughout the federal program, for research is an essential part of any forward-looking health plan.

(2) *To Train Professional Health Workers*

As provincial programs expand, personnel must be trained to staff them. For this purpose, there is, in addition to training provided under other grants, an annual federal grant of \$500,000 a year. Already, in several provinces, projects have been approved that will train more than 250 people in health work. These cover a great variety of avocations—from laboratory technicians to medical specialists. Sanitary inspectors, public health engineers, public health nurses, dentists, doctors, veterinarians—all are included in current projects.

(3) *Better Care for Crippled Children*

In Canada there are perhaps 50,000 crippled children. As soon as new programs can be developed, the federal grant of \$500,000 annually can be translated into preventive work to discover conditions that, if neglected, would lead to crippling. More adequate treatment will become available for those already crippled, and rehabilitation services will be provided on a larger scale.

(4) *More Active Control of Venereal Disease*

By more than doubling the existing federal grant for the control of venereal disease, the Federal Government has made increased control possible. Established programs for education, for the provision of drugs and for follow-up service are being continued. Part of the increased grant is being used in Manitoba and British Columbia for penicillin. In Prince Edward Island,

blood tests will be made of every person admitted to hospital. In Alberta, a new clinic is being established at Lethbridge, and a mobile clinic is being sent into the northern part of the province. In general, this increased grant is widening the reach of skilled treatment and extending to clinics and private physicians expert instruction in new treatment techniques.

(5) *Increased Efforts to Eradicate Tuberculosis*

The death rate for tuberculosis in Canada has declined strikingly, but this disease still represents a major national health problem. More than 4,000,000 patient-days a year are expended in tuberculosis institutions alone. As its causes are known and as cures are possible in most instances when it is discovered in time, the federal grant of from \$3,000,000 to \$4,000,000 a year should yield impressive results in the fight against tuberculosis. In the past 20 years the tuberculosis mortality rate has been reduced by 46 per cent. Let me spell out this impressive story: 1927, 68 deaths for each 100,000 of our population; 1932, 56; 1937, 49.5; 1942, 42.5; 1947, 36.8. This is the pattern of progress. In the next generation we should almost completely banish pulmonary tuberculosis from this country.

Projects that have been approved under the health plan include the distribution of streptomycin in five provinces. New equipment is to be provided in several provinces in very considerable amounts. Ontario hospitals will be equipped and assisted to give routine chest X-rays to all admitted, and Ontario's chest clinics are being expanded to cover its entire population. In British Columbia, a pool of X-ray survey equipment is being built up for the use of all general hospitals, and eleven new tuberculosis control units are being formed. In Alberta, free sanatorium treatment will be made available for non-pulmonary types of tuberculosis, making treatment for any form of this disease free in that province. New Brunswick has come forward with a variety of projects that fully utilize its grant of \$142,000 this year for tuberculosis control. These are some—by no means all—of the fundamental and far-reaching steps being taken as a result of the Federal Government's health plan.

(6) *Acceleration of Campaigns Against Cancer*

In contrast with tuberculosis, deaths from cancer have shown a marked increase in recent years—although this probably is partly due to improved diagnosis and to the aging of our population. Cancer is curable in some degree but great discoveries in cancer research must be made before this disease can properly be brought under control. Important steps have been taken to accelerate our campaign against cancer. Nearly two years ago, I met with representative leaders in the medical and other fields to assist in forming the National Cancer Institute of Canada, which has already launched forty-three significant research projects. I expect all of the provinces will agree to assign a percentage of their cancer control grant to support research under the Institute. Our hope is that if Canada, in common with other countries, puts enough energy into the study of cancer, in good time more of its secrets can be discovered.

Large-scale projects are now being put forward to utilize the annual \$3,500,000 cancer control grant. Prince Edward Island has received approval

for the organization and operation of two diagnostic cancer clinics. A doctor is to be given special training before becoming director of a cancer control division. Free cancer laboratory services are to be made available. New Brunswick is purchasing cancer therapy equipment for five new cancer treatment centres, and also purchasing a supply of radium. It is setting up six cancer diagnostic clinics. There are important cancer control projects for Manitoba and Quebec. Other provinces are preparing projects in cancer control under this national health plan that will have very far-reaching effects.

(7) *Management of Mental Illness*

Another major health problem is the prevalence of mental illness. At the beginning of January 1948 there were 54,667 patients in mental institutions in Canada—nearly half the total number of people in all Canadian hospitals. A federal grant rising in stages from \$4,000,000 to \$7,000,000 a year has been provided to fight this disease, especially by preventive measures. This federal expenditure should bring about important changes. Expert mental health care should extend beyond the mental hospital to become a living part of medical care in the general hospital and more easily available to the average citizen in his own community. For example, the federal plan makes possible a travelling mental health clinic in Prince Edward Island as part of a proposed mental health division. In Ontario, a large-scale program is under way at the University of Toronto to give special training in mental health to psychiatrists, physicians, psychologists, psychiatric social workers, nurses, and teachers in psychiatry and public health. In Manitoba, extensive work in occupational therapy is being developed in mental hospitals. In Saskatchewan, three teacher-psychologists are to be trained to act as liaison officers between mental health clinics, the school and the community. Part of this training is made possible by the professional training grant.

The mental health grant is bringing more expert psychiatric knowledge to the patients in mental hospitals. Hospital staffs are being strengthened and given additional training. The equipment and facilities of mental hospitals are being improved. Because of this federal aid, more attention can now be given to prevention in mental illness work and to treatment and rehabilitation.

(8) *Extension of Activities in Public Health*

In the present year, \$4,400,000 is being provided for provincial work in general public health. This grant will increase until it reaches \$6,500,000 a year and then continue on the basis of 50 cents per caput yearly. This grant is helping to expand existing public health facilities, and to put much greater emphasis on preventive medicine. For instance, in Prince Edward Island, branch laboratory services are being provided in the provincial and general hospitals. In New Brunswick, an integrated program of public health education and preventive dental hygiene is provided for. Saskatchewan has also established a division of dental hygiene. Bacteriological services in Regina are being improved and extended and the city's health services strengthened. In Alberta, a new health unit is to be set up to serve Drumheller and district.

British Columbia has already utilized 60 per cent of its public health grant of \$365,000. Public health education is being extended. A division of

preventive dentistry is being established. Special equipment is being provided to extend the facilities and services of local health units. To build new units, to expand the staff of those already in existence, and to expand public health nursing services, 15 additional nurses and 14 sanitary inspectors will be added to health unit personnel in British Columbia.

THE PATTERN OF PROGRESS

These examples do not yet indicate any completely coherent pattern in the advance made possible in provincial health fields by the national health program. They are representative of some of the first proposals that have been received and approved. From a study of all these projects and from a review of the 100 or so that came in during this week, I can say that all across Canada health activity is being greatly stimulated by this federal program. It builds on good foundations, for Canada's health levels are among the highest in the world. In the past twenty years our life expectancy has continued to advance. The general death rate is down by 17 per cent. Infant mortality is down by 44 per cent. Maternal mortality is down by 42 per cent. These are milestones in Canada's health history.

In some major diseases—notably, tuberculosis—there has been marked improvement; in others—particularly cancer—the reported death rate has considerably increased. In any event, while great progress has been made in controlling childhood diseases, it is clear that the incidence of many of the other diseases is still far too high. It is also clear that it is now within our power, because of the federal grants, to broaden greatly the scope of preventive medicine and to support more vigorously provincial campaigns against disease.

Ill-health makes inroads on human effectiveness and human happiness. This is a matter of concern both to the individual and to the nation. The national health program, by adding \$30,000,000 annually to the large amounts of money now being spent by all governments in Canada, is proof of the Federal Government's intention to help free as many people as possible from servitude to illness. There is no better justification for the expenditure of public funds than this great plan to assist the provinces in breaking down the barriers to good health, in finding out the cause and the cure of the killers and cripplers, and in strengthening the defences against all major and minor ailments that hinder human beings from full activity of body and mind.

THE IMPORTANCE OF PREVENTIVE MEDICINE

I have made this broad survey of typical projects to show what has been accomplished thus far under the federal plan and to keep you advised of the progress that is being made. I have not attempted to relate these new developments to your particular interests, although many of the projects outlined will mean much to you personally since you will help to bring them to fulfilment.

The fellows of the Royal College of Physicians and Surgeons, who lead in specialized fields of medicine, will, I know, give intelligent guidance to

medical training to keep it abreast of modern developments and current need. I hope that the new directions and new opportunities given to health action in Canada by this program will receive full consideration in medical teaching. I believe that the general practitioner—the "family doctor"—would like to play a greater part in public health work. If so, the first encouragement of this interest would be to put more emphasis on medical instruction in preventive medicine and public health generally.

It should be your concern, as leaders in Canadian medicine, above all else to guard against any action, whether it be by private agencies or by government, that would lower the standard of medical practice. All our health programs would fail if the intangibles of medical progress—the quality of medical training, the doctor's instinct for selfless service—should in any degree be allowed to deteriorate.

For those who, like myself, serve this nation in a public capacity, there is a clear duty to see that the nation's health receives the attention and the financial support it deserves. For everyone who, like the fellows of this college, serves the cause of better health, there is an equally heavy responsibility to support each progressive movement to bring health services to all Canadians who need them—regardless of their ability to pay.

Behind our thinking in setting up the national health program was the conviction that the energy our people had shown in war could find equally fruitful expression in peace through efforts such as this to widen for every citizen the opportunities for good health. Access to good health is a fundamental human right. And it is a right that every government must guard. When it became evident that the sturdy provincial defences against disease required reinforcement to protect the health of Canadians, the Federal Government took determined action in the manner I have described.

Time, I am convinced, and the furtherance of our freedom from disease will amply justify the bold and generous outpouring of this nation's resources in the cause of health through voluntary agencies, municipal and provincial governments, and through this far-reaching federal program.

This program represents, I believe, an important milestone in our attitude towards health care in this country. *It emphasizes that this is the era of preventive medicine.* I look forward to increased cooperation and unity of outlook between all who serve the cause of health, for all have a common objective—to achieve better levels of health for every Canadian.

Infant and Preschool Health

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ONE phase of the work of Nutrition Services of the Department of Health of New Brunswick has been carried on through child health conferences organized and conducted by the Public Health Nursing Service in rural areas. During the spring and fall of 1947, thirty-six of these conferences were held at monthly intervals, and thirty of them were visited by the medical director and nutritionists of Nutrition Services. Over four hundred children were seen at these conferences but complete records were obtained for only 319 children. Of these, 139 were under one year of age and 180 were between one and six years. No children who had passed their sixth birthday were included. At the time of the visit the children were given a medical examination, and a brief medical history was obtained. At most of the conferences the nutritionist set up a simple food demonstration. It was not possible to discuss nutrition with the mothers as a group, but the demonstration served to direct their attention to the matter of food so that the nutritionist was able to enlarge on the subject of the demonstration and discuss particular child-feeding problems with the mothers individually.

The original purpose of these conference visits was not to carry out a precise health survey of this infant and preschool group of children as much as to provide medical service in the form of an annual physical examination. However, the findings were recorded by one person under similar conditions and are on a uniform basis. They may be of interest to others carrying on similar activities and they provide useful nutritional information as to existing problems.

Immunization

Records indicated that 92 per cent of the preschool group had been or were being immunized against diphtheria and whooping cough. Nine who had had whooping cough were given toxoid only. A few of these may not have completed the course of three injections. Among the infants, 87 per cent of those over six months of age had been or were being immunized against diphtheria and whooping cough.

Dietary History

A record was kept of the number of children who were or who had been breast fed, the period of breast feeding, the time at which vitamin C and D supplements were added, and the variety in the diet at the time of examination. Only those children who had been nursed for at least two months were recorded as breast fed. Information as to when the preschool children first

received vitamin supplements was not considered sufficiently reliable to be of any significance.

The diets of infants were considered satisfactory if the child had received vitamin C and D supplements at three months and four items at least of milk, cereal, egg, potato, other vegetables, and fruit (other than citrus) by eight months of age. Younger children's diets were graded from the same variety, modified for the age of the child. Diets of the preschool children were classified more or less by the same standard of variety but the rule of vitamin C and D by three months was not rigidly adhered to if the diet at the time of examination was satisfactory. Table I indicates the dietary pattern of the infants and preschool children.

TABLE I
DIETARY PATTERN

Foods	Infants		Preschools	
	Number	Per cent	Number	Per cent
Breast fed	28	20	56	32
Vitamin D at 3 mos.	73	52.5		
No Vitamin D	19	13.6	28	16
Vitamin C at 3 mos.	73	52.5		
No Vitamin C	16	11.5	25	13.8
Unsatisfactory diet	38	27.3	64	35.5
Totals	139	100	180	100

One observation arising from the study is that breast feeding is not a very common method of infant feeding in the group studied. It is difficult to say why the infants were less commonly breast fed than the children of the preschool group had been. While it may not be of any real significance, there seemed to be a greater tendency toward breast feeding in more remote areas. In one county where many children were delivered by midwives and received little health supervision, 33 per cent of children were breast fed, contrasting with another county where most babies were born in hospitals and the breast feeding rate was 20 per cent. A proportion of 52 per cent of children receiving vitamin C and D supplements at three months can hardly be said to be good, although many babies who had first attended the conferences when over three months of age were receiving regular vitamin C and D supplements at the time of examination. The numbers of children in both infant and preschool groups who had not received any vitamin C and D supplements is a matter of concern. The larger number of unsatisfactory diets in the preschool group is not surprising since preschoolers as a rule are taken much more for granted and receive somewhat less careful supervision than do young infants.

Food Dislikes

Note was made of foods which the parents said were disliked. In the infant group there were not many children who disliked foods. Egg was the most frequently disliked food, followed by oranges, vegetables and cereal. In the preschool group food dislikes were beginning to take a more prominent

place. Milk was by far the most frequently reported food dislike, being mentioned more than any other two food groups. Vegetables, cereal, meat and egg followed in that order.

Physical Findings

An appraisal was made of the general physical condition of the children, including their nutritional status. Children were considered malnourished if two or more of the following defects were present: pallor, rachitic or scorbutic bone changes, thinness, poor tissue quality characterized by poor tone. The findings are shown in Table II.

TABLE II
INCIDENCE OF PHYSICAL ABNORMALITIES

Defect	Infants		Preschools	
	Number	Per cent	Number	Per cent
Poor colour	29	20.8	12	6.6
Squint	2	1.4	3	1.6
Enlarged tonsils and adenoids	1	0.7	52	28.8
Enlarged tonsils and adenoids and symptoms	0	0	9	5
Rickets	7	5	10	5.5
Scurvy	1	0.7	3	1.6
Congenital abnormalities	5	3.5	4	2.2
Malnutrition	23	16.7	21	11.6
Unsatisfactory physical condition	37	26	58	32
Total	139	100	180	100

It is a matter of regret that it was not practical to do haemoglobin determinations at the conferences. Of the children with poor colour doubtless many were anaemic, and others had sallow complexions and dark-circled eyes indicative in a less specific way of unsatisfactory physical condition.

The figures on enlargement of tonsils and adenoids in the preschool group are significant. Only those children who had definite symptoms such as middle ear infections, mouth breathing or recurrent colds or sore throats were recommended for tonsillectomy. It is easy to see that much more surgery would have been recommended if tonsillar enlargement alone had been the criterion.

The cases of rickets recorded were examples of frank rickets with two or more signs of bone changes. Other children had mild rachitic changes, but only those on which the diagnosis was definite were recorded as rachitic. There were no cases of acute scurvy with haemorrhagic manifestations but the evidence was sufficient to make a reasonably sound diagnosis.

Congenital abnormalities included three cases of squint, two of spina bifida, and one each of hare lip and cleft palate, congenital heart disease, congenital dislocation of the hip, and mongolian idiocy.

DISCUSSION

While the group of children examined could not be considered representative of all New Brunswick children, it was thought to be fairly

representative of children in rural areas and particularly of the counties covered. The findings indicate that the conferences are accomplishing one of their purposes, that of bringing immunization against diphtheria and whooping cough to children in rural areas. The dietary picture is not as satisfactory. In the matter of supplements of vitamins C and D, the percentage of infants receiving adequate and early dosage is certainly not high enough. The correction of this deficiency lies in earlier contact, since the majority of mothers are quick to add the supplements once the need is pointed out. The fairly large group of children who had received no supplements constitute somewhat of a problem since the parents of many of these children seem much less receptive to suggestions on health supervision of both infants and preschool children. Sometimes cod liver oil was considered a preventive or even treatment for colds and not as a standard item of diet needed for bone formation. The large percentage of children receiving insufficient variety in their food is not surprising. While economic factors of distribution and supply do enter the picture, the lack of variety in infant diets would seem to be a matter of custom. Some mothers were only slowly educated to the inclusion of solid foods in the infant's diet.

The findings of physical examination were not remarkable, yet they did indicate that the physical condition of these young children left something to be desired. Anaemia, rickets, and scurvy were present, and all three are preventable diseases. The majority of the congenital abnormalities present were receiving corrective treatment. Another group of children designated in unsatisfactory physical condition did not show definite defects yet gave a poor impression because of poor muscular development, flabby tissue, pallor or mild rachitic changes and could not be considered as healthy children.

SUMMARY

Child health conference visits in several counties in New Brunswick emphasized the need, which had been already appreciated, for health supervision of young children, particularly in rural areas remote from health services. Parents welcomed the opportunity to have children immunized against diphtheria and whooping cough. While they did not always appreciate their need for dietary advice and other assistance, they were usually receptive to suggestions and in time this educational aspect of the work carried on at child health conferences will surely result in a higher level of child health in New Brunswick.

Teacher Workshop Techniques

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IT is a known fact that the teacher is the key person in the complete school health program, for it is she who observes children continuously and learns to know the well child and the child who deviates from normal. In order that her instructional program can bring to the child the most that she can offer, she should be cognizant of the relationship between the school health services and educational principles. Therefore, any teacher who is to do a good job in helping children to learn must be equipped to understand the child, his background, his problems, his physical and mental limitations and to be able to give him assistance in the understanding of how to keep in good health. To equip the teacher for this complete understanding, any workshop must include information in regard to the school environment, the school health services and health instruction.

The teacher workshop should be made up of individuals who have not only a broad teaching background, but also some experience in the field of health. It is my feeling that the teacher who is unprepared basically in education, as well as in health courses, should not attempt to attend a workshop in a true sense of the word, but instead should take further courses in both education and health in order to give her the basic prerequisites needed for a workshop experience. Teachers in a workshop should be able to exchange ideas, to discuss common problems, and to know how to work in the workshop situation. If possible, the class should be made up, not only of teachers, but of individuals who are basically a part of a total school health program. These include public health personnel such as nurses and sanitarians, parents, school board members and administrators. Many a teacher has been balked when she returns from her workshop experience because her administrator or the school board members do not fully recognize why she attended the workshop, what she was trying to get out of it, and what value she had to offer to the program upon her return to the school area.

It is of value to the teacher to learn the contributions of these various other individuals to a total school health program; it is valuable to all the people involved to "grow up together." Of course, this, like any other workshop, needs to be a problem-solving situation and because, for the most part, teachers attending the workshop will be from many school areas, the problems discussed should involve those from which the teacher came. Thus,

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it is only natural that, in so far as is possible, specialists in the health education fields should be secured from local areas, for it is ironic, indeed, to see that many times these specialists or people who are to carry out the work, namely the teachers, administrators, etc., have never even a speaking acquaintance with the public health personnel and voluntary agencies.

Before coming to the workshop the teacher should discuss with her administrators those problems which the administrator feels are significant in his school, and the teacher should then make an effort to bring these to the attention of the workshop staff and try to solve these particular needs during the course of the workshop. I do not mean to infer that specialized lecturers should not be included from areas larger than the local situation, for often there are individuals who are highly trained to discuss special problems in health. Indeed, some local personnel are usually not equipped to cover adequately all of the areas which should be included in a teacher-workshop curriculum.

The average number for the workshop should range between 20 and 30. It has been found to be of great value to have at least two to four persons from the same school situation to serve as a nucleus for the growth and development of a program when the students return to their own areas. For the most part also, it has been found more successful not to have too wide-spread a gradation among the workshop participants—for, of necessity, this involves specialized personnel who are familiar with techniques of teaching between kindergarten and the twelfth grade. It is obvious that this would necessitate an enlarged staff with an extremely broad scope of training and experience, also facilities, such as visual aids, consultant's materials, and field experience, which would run the gamut of all of these various grade levels.

The workshop facilities, in order to be adequate, should include sufficient quarters such as lecture space, library space, work rooms, all equipped with tables and materials including visual aids.

One of the basic essentials of a good workshop is a well qualified secretary who can prepare the materials which need to be distributed for each session and can take notes on the information presented by the guest lecturers. A great deal must be done in the area of "small courtesies" such as sending invitations to the lecturers, reminding them of the date on which they are scheduled to speak, sending "thank you" letters after their talks and sending them copies of the lectures that have been presented. Yes—a basic essential of a teacher-workshop is a good secretary.

In any problem-solving situation, it is essential that groups of individuals who have similar interests be formed. These may include teachers of the same grade level—that is—primary, intermediate, upper or high school teachers, teachers of the same environment, namely, rural, semi-urban or city, or teachers with the same interests. A group may be composed of those desirous of discussing ways of improving the environment, or shall we say, adapting to ways of administering the limitations of the environment; it may be composed of those desiring to develop units of work which may be

combined in the development of a complete course of study in health education.

Teachers, nurses, school board members with like interests may interchange experiences which can help each to develop new ideas to carry to their own committees. The specialists, be they local or provincial or from other areas, must be the ones to guide the group along in its thinking to expand the point of view to include other areas of health interest. So often the workshop committees concentrate on too narrow a problem and without guidance are unable to see what else can be discussed. They also do not see the value of bringing other health education concepts into their own sphere of thinking in order to broaden through other subject fields the particular interest they have in mind.

The consultants for the workshop can be drawn from both education and health. From education the workshop "resource" persons may include administrators, supervisors of curriculum, visual aids supervisors, visiting teachers, lunch room supervisors, school psychologists and school medical and nursing personnel. From the health department much assistance can be secured by using consultants in the fields of communicable disease control, public health nursing, sanitation and health education. Many voluntary agencies have personnel which can be brought into the workshop situation. The chief concern is to appraise the timbre of the individuals and their tempo of thinking and to bring into the group the particular resource persons who can contribute to the needs of the discussion. The workshop director, of course, needs to ascertain the trends of the discussion groups and supply the resource persons at the right moment. Democratically speaking, the differences between instructor and student should reach a minimum and the interchange of ideas should be on an equal basis. It behooves the student in this case to be well qualified in health and education, well read on the subjects for discussion and of a type which can adjust readily to the desires of the group. This type of student with strong resource personnel should bring about fundamental changes in the health attitudes of the communities from which the students come.

Studies of the Complement-fixation Reaction in Virus Systems

IV. MUMPS VIRUS ANTIGENS AND ANTISERA

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PREVIOUS studies with three other virus systems (1-3) have shown the type of quantitative complement-fixation technique developed by Wadsworth, Maltaner and Maltaner (4, 5) to be useful in studies of viral infections as well as in the diagnosis of syphilis and of various bacterial diseases. The following paper reports the results of a limited investigation with the mumps virus using this technique.

The investigations of Enders and his co-workers (6-12) and of others (13-16), in which "serum dilution" methods have been employed, have indicated that the complement-fixation test with mumps virus antigens may be of considerable practical value in the study and diagnosis of mumps, particularly of the less common manifestations such as meningoencephalitis (9). Henle, Henle and Harris (15) have recommended the parallel use of two mumps virus antigens, one, a pool of allantoic fluids, the other, an extract of chorioallantoic membranes from chick embryos infected with mumps virus since the former had been found to have a high concentration of the virus bound "V" antigen whereas the latter contained larger amounts of the smaller, soluble "S" antigen. In this (15) and in a later paper (16) these authors have shown that in both naturally and artificially infected individuals complement-fixing activity with the "S" antigen tends to appear earlier than with the "V" antigen and may even reach a relatively high level before there is a demonstrable rise in "anti-V" titre. They found titres with the two antigens to be relatively comparable in convalescent-sera but that subsequently antibodies for the "S" antigen decreased more rapidly than those for the "V" antigen and might eventually disappear, leaving only the latter activity, which might however persist for several years.

In view of these results (15), both types of antigen were used in our present studies. The first antigen, M_1 , was a pool of allantoic and amniotic fluids from 8-day chick embryos that had been infected with mumps virus by the allantoic route and incubated for an additional 4 to 5 days before harvesting the fluids; the second antigen, M_2 , was the supernate from a 20 per cent extract of pooled chorio-allantoic membranes from these embryos. Both types of antigen were heated for 30 minutes at 50°C. before use. No attempts at purification were made. Control antigens were prepared in a

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similar manner from uninoculated chick embryos. All sera were frozen as soon as possible after receipt and maintained in the frozen state until just before testing.

Standardization of Reagents

The methods of standardization and testing were essentially similar to those described in earlier papers in this series (1-3). The "specific" complement-fixing activity of the antigens was determined with mumps convalescent sera. All reactions were compared in terms of K' , the amount of complement required for 50 per cent haemolysis of the standard volume of maximally sensitized 5-per-cent sheep red cells. When the value of K' was not determined directly, an estimated value was obtained by reference to tables of conversion factors prepared for tests with vaccinia virus systems (1). As in many other antigen-antibody systems, it was found that when convalescent sera of sufficiently high titre had been selected and the quantity used had a complement-fixing capacity of 15 to 20 units¹ linear relationships were observed between K' and the amount of antigen present. From these complement-antigen lines, the amounts of antigen fixing 3, 6 and 9 units of complement were read. Twice these respective amounts were selected as the "standard" quantities of antigen for tests of sera with 3, 6 and 9 units of complement.

All sera were tested in 0.05 ml. amounts for complement-fixing in the absence of antigen, using 1 and 2 units of complement, and with the M_1 and M_2 antigens using 3, 6 and 9 units of complement. The titre of the serum was expressed, as is customary in this type of test, as the ratio $K'_{s,a} : K'_{s,a}$, in which $K'_{s,a}$ represents the amount of complement required for 50 per cent haemolysis with 0.05 ml. of serum alone, and $K'_{s,a}$ indicates the amount of complement needed for the same degree of haemolysis with 0.05 ml. serum in the presence of antigen. When values of K' greater than 10 were obtained, that is when less than 40 per cent haemolysis was observed in the test with 9 units of complement, the titrations were repeated using 0.05 ml. of serial twofold, or closer, dilutions of serum. On plotting the values of K' against the amount of serum used, approximately linear relationships were observed. Hence K' values for 0.05 ml. undiluted serum could be readily estimated by linear extrapolation.

Tests of Sera

Five groups of human sera were tested with the two mumps virus antigens, M_1 and M_2 . The first of these groups consisted of specimens from 15 cases diagnosed clinically as mumps encephalitis. Almost all of these specimens were collected early in the disease, shortly after onset of symptoms. Table I records the titres for these 15 specimens as well as those for sera from 8 cases of encephalitis of undetermined origin, that also occurred in the Ottawa district during approximately the same period (Group II). As indicated in this table, the majority of mumps encephalitis specimens, 10 of the 15, had

¹The unit of complement is taken as the amount of previously unincubated complement required for 50 per cent haemolysis of 0.1 ml. of a suspension of maximally sensitized sheep red cells in 30 minutes at 37°C.

TABLE I
RATIO TITRES OF SPECIMENS FROM 15 CASES OF MUMPS
ENCEPHALITIS AND FROM 8 CASES OF ENCEPHALITIS
OF UNDETERMINED ORIGIN

Number of Specimen	Clinical Diagnosis	Titre		Number of Specimen	Clinical Diagnosis	Titre	
		M ₁	M ₂			M ₁	M ₂
M 4165	Mumps encephalitis	4.1	20	M 4237	Mumps encephalitis	12	42
M 4188	"	5.2	15	M 4245	"	2.9	7.9
M 4189	"	6.6	10	M 4246	"	43	80
M 4206	"	2.0	8.2	M 4360	"	6.0	17
M 4207	"	2.0	4.8				
M 4208	"	3.5	6.7	M 4181	encephalitis	3.0	3.7
M 4214	"	4.1	9.1	M 4192	— cause	4.0	6.5
M 4221	"	3.5	54	M 4199	unknown	3.7	8.3
M 4222	"	9.2	119	M 4235	"	3.9	6.6
M 4229	"	9.1	62	M 4337	"	5.4	6.9
M 4230	"	9.0	18	M 4354	"	5.8	4.5
				M 5089	"	2.0	2.0
				M 5093	"	1.8	2.6

titres of 10 or over with the M₂ antigen; only two had titres of over 10 with M₁. This is in agreement with the findings of Henle, Henle and Harris (15, 16) that acute phase specimens may have higher titres with the "S" type than with the "V" type of antigen. None of the miscellaneous encephalitis specimens had titres of over 10 with either M₁ or M₂; four specimens had titres of 5 to 10 with both M₁ and M₂ or with M₂ only; two specimens showed negligible fixation, a titre of less than 3.0, with both M₁ and M₂.

A summary of the distribution of complement-fixing titres with M₁ and M₂ in the other three groups of sera is presented in Table II. Group III consisted of 61 specimens sent to the Ottawa Laboratory of the Ontario Department of Health for routine serologic examination for evidence of syphilis; all were negative in these routine tests. Group IV was made up of paired speci-

TABLE II
DISTRIBUTION OF TITRES WITH M₁ AND M₂ ANTIGENS IN THE FIVE
GROUPS OF HUMAN SERUM

Group	Number of Sera	Antigen	Number of sera with Titres of—				Maximum Titre
			2.0	2 to 5	5 to 10	10 or Over	
I. Mumps encephalitis	15	M ₁	2	5	6	2	43
		M ₂	0	1	4	10	119
II. Encephalitis (cause not determined)	8	M ₁	2	4	2	0	5.8
		M ₂	1	3	4	0	8.3
III. Routine diagnostic	61	M ₁	11	46	4	0	7.1
		M ₂	8	47	6	0	9.5
IV. Encephalitis (a) acute phase	25	M ₁	5	15	5	0	7.4
(b) convalescent		M ₂	8	11	5	1	10
V. Poliomyelitis (a) acute phase	17	M ₁	1	20	4	0	8.8
(b) convalescent		M ₂	2	16	5	2	13
		M ₁	5	9	3	0	5.1
		M ₂	4	10	3	0	7.7
		M ₁	6	4	7	0	6.9
		M ₂	5	6	6	0	6.9

mens, acute phase and convalescent, from 18 cases of encephalitis and 7 cases of suspected encephalitis. Group IV included paired specimens from 17 cases of poliomyelitis. The sera of groups IV and V which had been submitted initially to the Laboratory of Hygiene, Department of National Health and Welfare, Ottawa, had been collected during a small outbreak of encephalitis that occurred in the Province of Manitoba in the early autumn of 1947. None of the specimens in groups III and V had titres of over 10 with either antigen, and the majority had titres of less than 5.0. With the exception of three specimens from two cases, those of group IV also had titres of less than 10. The acute phase and convalescent sera from the two exceptional cases had titres of 9.9 and 13, and of 10 and 11, respectively, with M_2 . The titres with M_1 were lower—5.3 and 7.4, and 4.3 and 4.4. On a statistical basis at least, this suggested that these persons may have been suffering from mumps encephalitis or have had some other form of mumps relatively recently, since titres over 10 with M_2 had not previously been encountered except in known mumps infection. Unfortunately no information on this point accompanied the specimens. In contrast to the results obtained with the mumps encephalitis specimens, the percentage distribution of titres in the last three groups of sera was on the whole relatively similar for M_1 and M_2 . None of the specimens in any of the groups displayed significant fixation (titres of 3.0 or over) with either of the control antigens.

DISCUSSION

As stated in the introductory review, complement-fixation tests with mumps virus antigens have given promise of being of considerable usefulness in the differential diagnosis of the encephalitides. Since it has been increasingly recognized within recent years that mumps meningoencephalitis occurs quite frequently as a complication in mumps virus infection (17-20), sometimes appearing earlier than parotitis, or even without parotitis, the need for such a serologic aid in diagnosis is well recognized. In contrast to many other acute viral infections, a significant degree of complement-fixing activity may be demonstrated in many cases of mumps shortly after the onset of symptoms, a fact which may possibly be related to the relatively long incubation period in this disease. During the period before the appearance of symptoms, considerable multiplication of the mumps virus may occur, with resultant stimulation to antibody formation. This early rise in antibody titre may, however, create a problem in the interpretation of the diagnostic significance of the serologic results. For example, if in a case of suspected mumps the first specimen has already shown marked complement-fixing activity with mumps virus antigens, the increase in titre in the second specimen may be relatively slight. Lacking the differential criterion of a significant rise in titre, a tentative diagnosis of mumps virus infection in a patient with no recorded history of this disease might be based on the fact that one or both of these specimens had complement-fixation titres with mumps virus antigens definitely higher than those ordinarily encountered in the general population and more particularly if the titres had been definitely higher with the "S" type of antigen (15, 16).

Enders and his associates (11) considered a serum dilution titre exceeding 192 as presumptive evidence of mumps, since they had rarely found such a titre in normal individuals. On the basis of the very small series of experiments reported in this paper, a $K'_{\text{ss}} : K'_{\text{s}}$ ratio of over 10 with the M_2 antigen might be taken as a possible indication of mumps virus etiology, in that titres of 10 or over were found in 10 of 15 cases diagnosed clinically as mumps encephalitis, whereas in only 2 of the 111 persons in the control groups were titres greater than 10 found. Furthermore, the possibility that these two individuals may have had a current or recent mumps virus infection was not excluded.

SUMMARY

The conclusions of previous investigators that complement-fixation may be a useful tool in the differential diagnosis of mumps virus encephalitis, is supported by the results of these limited studies in which a more detailed quantitative technique has been employed. As had been reported earlier by Henle, Henle and Harris (15), titres during the acute phase of the disease were found to be higher with an extract prepared from chorio-allantoic membranes of chick embryos infected with mumps virus than with pooled allantoic fluids from the same source.

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MARKING THE CENTENARY OF PUBLIC HEALTH

IN 1848, legislation was enacted by the British Parliament establishing the General Board of Health. It was only under duress that Parliament passed the legislation, and the Board's initial tenure of office was limited to a period of five years. Edwin Chadwick, a lawyer who was obsessed with what he termed "the sanitary idea," had presented irrefutable facts concerning the unsatisfactory state of health of the labouring classes in Great Britain. His charges had been substantiated in the findings of a Royal Commission. Fear of an outbreak of cholera, with the memory of the ravages of that disease in 1831 and again in 1847, was an important factor in bringing about this action of Parliament. The legislation established, for the first time in any country, responsibility for a central board of health, and although the Board so created had but a short and stormy period of existence, public health was accepted as a responsibility of the central government.

Chadwick has been called "the father of English public health." The amendment of the Poor Law Act in 1834, with its drastic provisions for reform, was passed by Parliament largely through Chadwick's work as a member of the investigating Commission of the Poor Law. Later, as secretary of the newly established Poor Law Commission, he was the centre of continuous conflict because of the ardour with which he performed his duties and because of his uncompromising attitude. Finally, in 1845, he was relieved of his office. During these years he had become more and more convinced that the remedy for much of ill-health and pauperism lay in improving sanitary conditions, and his zeal for the creation of a central authority for the advancement of health led finally to the action of Parliament in 1848.

Chadwick contributed in many ways to the improvement of health and welfare. He pressed for the collection of vital statistics and was successful in having the General Register established. Through his efforts, Dr. William Farr was appointed as compiler of abstracts in the office of the General Register, in 1839. Chadwick's observations on the sanitary conditions were recorded in numerous reports and in the findings of the Royal Commission appointed in 1842 to investigate health conditions. He rendered valuable assistance to Lord Ashley, afterwards the Earl of Shaftesbury, in the fight for

the protection of women and children working in factories. He was instrumental also in organizing the Health of Towns Association, being possibly the first in Great Britain to recognize the importance of voluntary assistance in public health work.

Five years after its establishment, the General Board of Health was replaced by a board which was openly opposed to centralization of authority and was not in accord with Chadwick's conviction that health was a concern of the central government. Chadwick was deposed, and it was fortunate for public health that a new leader, Dr. John Simon, was ready to carry forward the efforts for sanitary reform. The first medical officer of health in Great Britain was Dr. John Duncan, who was appointed to serve in this office in Liverpool in 1847. The contribution of medical officers of health and the accomplishments of public health during the hundred years following the first appointment in 1847 of a medical officer were fittingly recorded last year in the leading medical journals of Great Britain. The second medical officer was Dr. Simon, who was appointed to serve the metropolitan city of London in 1848. In 1854 he was named Medical Officer for the General Board of Health and served for the remainder of the Board's second term of five years. When the functions of the Board were transferred to the Privy Council in 1858, he continued as its Medical Officer, serving until 1871. During these years he made many investigations, including outbreaks of disease, housing conditions, nutrition, and the health problems of industrial workers. Like Chadwick, he was convinced that the public could be provided with the essential health services only through the organization of local health authorities. He was instrumental in having Parliament create a Royal Commission to investigate the sanitary conditions of the larger centres of population, and it was after the presentation of the Commission's report that the Local Government Board Act of 1871 was passed by Parliament, establishing a government department which would administer public health and the Poor Law as well as the work of the nuisance authorities. It is well to remember that this Act, and the Public Health Act which followed it in 1875, provided every part of England and Wales with local health authorities; required the appointment of a medical officer of health and a sanitary inspector for every community; and made provision to pay half the salary of the Poor Law medical officer, the medical officer of health and the sanitary inspector. On these foundations was built public health in Great Britain.

In Canada the epidemics of cholera, and in particular the very extensive outbreak of 1847 to which was added the devastation of typhus fever, caused the first Parliament of the united Upper and Lower Canadas to create in 1849 a Central Board of Health. Again, the Central Board was considered necessary only to meet the epidemic and, in consequence, the Board ceased to function within a few years of its establishment. When cholera threatened in 1864, the Board was revived, but again functioned only for a brief time. It is not surprising that the Act of Confederation of 1867, which established the Dominion of Canada and defined the responsibilities of the new federal government, made but little reference to health. The Provinces retained the

responsibility for the treatment of disease and for hospitals and charitable institutions. To the newly established federal government were assigned limited responsibilities including maritime quarantine, the collection of vital statistics, and the care of Indians.

It was fitting that the American Public Health Association, at its annual meeting in Boston last month, should pay tribute to the work of Lemuel Shattuck, who nearly one hundred years ago pioneered, as did Chadwick in England, the cause of sanitary reform. A general session of the meeting was devoted to papers on his great work and its message for today. Contributing to this program, Dr. C.-E. A. Winslow, in an address which will be read with great interest by all students of public health, reviewed the report which Shattuck presented for the commissioners appointed to conduct a sanitary survey on behalf of the State of Massachusetts. Shattuck, it will be remembered, was not a physician, but a book publisher. As early as 1841, he had completed with great labour "A Study on the Vital Statistics of Boston" and, as a result, he was instrumental in having passed by the State of Massachusetts the first Registration Act relating to births, deaths and marriages. As a member of the commission appointed to conduct the sanitary survey, Shattuck resembled Chadwick in his boundless energy and his keen insight into the fundamental problems. The report, presented in 1850, and constituting a volume of three hundred pages, has proved to be a classic of clarity and force. It was a blueprint for the promotion of public health and included the establishing of a state board of health that would work in co-operation with effective local boards of health. In all, it contained fifty specific recommendations. In analyzing the soundness of these recommendations, Dr. Winslow found that thirty-six were incorporated into the routine practices of public health; that ten constituted a direct and immediate challenge to us today; and that only four could be considered unimportant. It can be fairly said that a century ago Lemuel Shattuck previewed every field of public health being explored today.

One hundred years ago, foundations were laid on which there has been erected a modern structure of public health. There is a rich reward for those who read the reports of Chadwick, Shattuck, Simon, Farr, and other great pioneers in public health. The reprinting of the "Report of the Sanitary Conditions in Massachusetts" by the Harvard University Press in cooperation with the Massachusetts Public Health Association and the American Public Health Association, makes this outstanding document available to everyone.

NEWS

British Columbia

MORE WIDESPREAD USE of penicillin for the treatment of syphilis is being made possible through funds provided under the Federal Government's national health grants. Until now, penicillin has been used only in a limited number of cases where hospitalization was not possible.

The new health grant will also enable a technician now on the provincial laboratory staff to attend a special course in serology at the Laboratory of Hygiene in Ottawa. The course is designed to standardize techniques and ensure uniformity in laboratory procedures in the diagnosis and treatment of syphilis.

Alberta

A CLINIC for the diagnosis and free treatment of venereal diseases will be established in Lethbridge and a mobile V.D. clinic will be purchased for use in the northern part of the province. The cost of these projects, estimated at more than \$17,000, will be charged against the increased grant for venereal disease control under the national health plan.

DURING THIS YEAR 359 cases of poliomyelitis, with 23 deaths, have been recorded. This is the highest incidence since 1927, when 355 cases and 65 deaths were reported.

FIELD SURVEY WORK in Rocky Mountain spotted fever, sylvatic plague, and tularaemia has been conducted by the division of entomology. No cases of tick-borne diseases were recorded during 1948. Vaccination against Rocky Mountain spotted fever was conducted last year, and during this year 1,854 persons were vaccinated at clinics arranged by the Department of Health.

MISS E. ALSGARD has been appointed senior public health nurse in the newly organized Drumheller health unit.

Saskatchewan

THE ESTABLISHMENT of a division of dental health, with Dr. A. E. Chegwin of Moose Jaw as its director, has been announced. The new division will develop preventive dentistry and, in cooperation with the Saskatchewan College of Dental Surgeons, will endeavour to strengthen all dental services in the province. One of the first steps to alleviate the shortage of dentists will be the

preparation of a list of towns which could support a practitioner under sufficiently attractive conditions of practice.

Manitoba

MANITOBA'S PROGRAM of assisting patients in mental hospitals toward recovery through occupational therapy and recreation will be extended with funds from the federal health grants. Two directors of occupational therapy and recreation are to be appointed, one at Brandon and one at Selkirk. At the latter centre, the present staff of two occupational therapists will be increased by an additional therapist and five assistants. This will enable the program to be enlarged to include more of the chronically ill patients. Approximately \$7,000 of the grant has been set aside to purchase new equipment for the Brandon hospital.

FACILITIES for training student nurses at the Selkirk mental hospital are being extended with the establishment of a nutrition laboratory to permit of instruction in food values and in the preparation of nutritious meals.

TWENTY-THREE of the province's public health workers are being assisted in obtaining additional professional training under the new health program. Fourteen are nurses, eight are student sanitary inspectors, and one is a laboratory technician.

DR. WILLIAM WATT, a graduate of the University of Aberdeen, has been appointed medical health officer at Neepawa.

Ontario

THE PURCHASE of a mobile X-ray unit for community tuberculosis surveys in Ontario has been approved under the new national health plan. In addition to those required to operate the new unit, four physicians, five technicians and clerical help will be provided. The province already has two mobile X-ray units and two portable units mounted on trucks.

TORONTO HOSPITALS have received a grant of \$1,071,353 to cover part of the losses sustained during 1946 and 1947 in the care of indigent patients. It is estimated that this sum will cover 80 per cent of these losses. The hospital claims were settled on the basis of costs of the Toronto General Hospital for the care of adult public ward patients. This

hospital had the lowest per diem cost of the city hospitals, amounting to \$4.92 and \$5.91 in 1947.

PHYSICIANS' SERVICES INCORPORATED report 10,500 subscribers as at September 1, 1948. This number enrolled in the first six months of operation and represents 185 groups. Approximately 2,150 doctors have agreed to participate in this plan for medical care.

DR. J. C. MEAKINS, president of the Canadian Cancer Society, reports that the recent affiliation of the National Cancer Institute of Canada with the Canadian Cancer Society has resulted in an intensified and co-ordinated drive towards the control of this disease. The Society has accepted responsibility for public education and welfare services, and is responsible to a large degree for the raising of funds for the National Cancer Institute. The Society has a voluntary membership of 350,000.

THROUGH THE CANADIAN RED CROSS SOCIETY, the League of Red Cross Societies is making available to Canadian nurses, at the subscription rate of \$1.00 a year, the publication entitled *Information Bulletin for Red Cross Nurses*, which appears in English, French, German, and Spanish. Those desiring to subscribe may do so by writing to the Nursing Department, Canadian Red Cross Society, 95 Wellesley Street, Toronto 5, Ontario. This quarterly bulletin carries articles designed for nurses serving in the Red Cross but also is of interest to nurses throughout the world as a means of sharing information on an international basis.

DR. P. A. SCOTT, D.P.H., is serving as chief medical officer for the Simcoe County Health Unit, with headquarters in Barrie. Dr. R. M. King, of Manitoba, has become assistant medical health officer.

DR. J. I. JEFFS, D.P.H., of St. Catharines, has been appointed assistant medical health officer of the St. Catharines—Lincoln Health Unit.

DR. ROBERTA ROBINSON, D.P.H., is assistant to the director of the Bruce County Health Unit.

DR. W. E. HENRY has been appointed medical health officer of York Township, after having served for twelve years as medical officer of Weston. He has succeeded

Dr. C. A. Warren.

Quebec

DR. MARCEL LANGLOIS, Quebec City, professor of paediatrics at Laval University, has been appointed as a paediatrics specialist in the child and maternal health division of the Department of National Health and Welfare.

New Brunswick

DR. AUSTIN M. CLARKE, formerly superintendent of the River Glade Sanatorium, has been appointed chief of the service of health planning in the provincial government. He will direct the survey of the health needs of the province and will act as liaison officer with the Department of National Health and Welfare.

Nova Scotia

DR. WILLIAM H. FROST, D.P.H., Halifax, has been promoted by the Civil Service Commission to be medical officer in charge of quarantine, immigration medical and sick mariners' services at Halifax. He succeeds Dr. J. L. Cook, O.B.E., who has been superannuated after many years of distinguished service.

Dr. Frost has been with the federal department for the past eight years and during the war was an assistant medical officer in all the division's medical work in Halifax. In the last fiscal year the quarantine service at Halifax inspected over 500 vessels carrying more than 88,000 passengers and crew, and in addition treated sick mariners and assisted materially with immigration medical examinations.

Prince Edward Island

THE USE of federal funds from the national health grants has been approved for extending the provincial program for the prevention and treatment of mental illness. It is planned to appoint a psychiatrist to organize and conduct an active treatment centre at the Falconwood Hospital. A field branch for the proposed division of mental hygiene will also be developed. It will be set up on the travelling-clinic principle, and will be staffed by a psychiatrist and either a psychologist or a social worker. Its services will be available for the treatment of mild mental illness.

ABSTRACTS

Mass Blood Testing in Eight Georgia Communities.

THE program of mass testing for syphilis described in this paper follows the pattern of mass X-ray surveys for tuberculosis, and indeed in this instance the two were combined. It is disappointing that results of the chest X-rays are not reported but the syphilis study is very interesting. Details of the campaign, publicity, location and staffing of blood-testing and X-ray stations and all other arrangements are described and should be of great interest and value to venereal disease control officers.

The population of the communities was approximately 573,000, and 288,028 submitted to tests on a voluntary basis. This alone constitutes a tribute to the educational publicity program. Some 14 per cent had either a positive or doubtful serological reaction and 9 per cent (26,568 persons) were found to be infected with syphilis. One-third of this number were cases not previously known to treatment and of these one of fifteen was in the primary or secondary stage. In areas where intensive contact investigation was pursued the percentage of primary and secondary stage syphilis was higher than in areas where this was not done. Thus mass blood testing combined with intensive contact investigation constitutes a very productive method. In different communities from 11 to 47 times as many previously unknown cases of early syphilis were uncovered as would ordinarily have been reported during an equal period.

C. D. Bowdoin, *J. Ven. Dis. Inf.*, 1948, 29: 126.

Gamma-Globulin in the Prevention and Attenuation of Measles.

AN EXTENSIVE trial of gamma globulin, supplied from the U.S.A., in the attenuation or prevention of measles was made among home, hospital, school, and nursery contacts of measles. In the first tests this material was compared with convalescent measles serum and it was found to be rather more than twice as potent as the latter. A second experiment was set up to compare the potency of gamma globulin prepared by five different

commercial firms. One batch was found considerably less effective than the other four. Omitting the results of this defective batch, prevention or attenuation was obtained in 94 out of 95 injected contacts.

A third experiment was designed to test out-dated material. Little loss of potency could be demonstrated in samples nearly 2 years old, attenuation or protection resulting in 99 per cent.

Report of a Subcommittee to the Blood Transfusion Research Committee of the Medical Research Council. The Lancet, July 10, 1948, p. 41.

Pulmonary Tuberculosis in the Old

THE author calls attention again to the importance of this problem which, while discussed by many workers in the past, is not generally appreciated. Too often tuberculosis in the aged is regarded as uncommon, chronic and relatively benign. This is accounted for, in part, by the insidious nature of the onset and symptoms, and because the disease is mistaken for part of the general process of ageing.

From a unit of general wards for the period 1938-46 records showed 69 patients aged over sixty to have tuberculosis. The number may actually have been greater. Tubercle bacilli were found in the sputum of 34 or roughly 50 per cent. Again, the actual number with positive sputum was probably greater. Cough, loss of weight, and haemoptysis were the principal symptoms. Treatment of the aged with tuberculosis must be conservative and their disposal may be a problem.

Investigation of the older sick patients would reveal a surprisingly large number with active lesions and positive sputum. Hospital admission X-rays should prove valuable for this group.

F. J. Hebbert, *Lancet*, 1948, 6520, vol. CCLV: 247-249.

Penicillin Therapy in Scarlet Fever and Complicating Otitis.

SINCE DECEMBER 1945, two thousand cases of scarlet fever were treated with penicillin. A routine of 90,000-150,000 units twice a

day for six days was followed. The results were most satisfactory. Patients were discharged on an average of eight days after admission and on careful follow-up none had developed scarlatinotis or nephritis. The nose and throat were found free of haemolytic streptococci within 48 hours but to prevent their reappearance it was found necessary to continue treatment for six days. Maintenance of bacteriostatic blood levels of penicillin by giving three-hourly injections or by using penicillin preparations to give slow absorption was found unnecessary for control of the organism.

The first 200 cases treated in the above fashion were compared with an alternate and comparable control series of 200 cases treated with sulphanilamide for eight days. In the latter group 73 per cent still harboured haemolytic streptococci at the end of treatment and 53 per cent on discharge from hospital in contrast to 4 per cent of the penicillin-treated group who harboured the organism at the end of treatment. Complication rates were 49.5 per cent for the sulphanilamide group and 5.5 per cent for those receiving penicillin. Duration of sore throat was significantly shorter in the penicillin group and the average febrile period was only 4.5 days compared with 7 days for those on sulphanilamide.

The superiority of penicillin over previous treatments is obvious and represents a great advantage in terms of hospital days saved. In addition, with only two daily doses of penicillin required, home treatment is rendered possible where early isolation can be observed.

Patients entering hospital with streptococcal otitis also responded well to penicillin. Only four per cent approximately required mastoidectomy in contrast to 21-38 per cent in cases treated with sulphanilamide.

Torben Jersild, *Lancet*, 1948, 1: 671.

First World Health Assembly

SIXTY-SIX NATIONS were represented at the Assembly of whom fifty-four were members of the World Health Organization. Agreement among this diverse group on a satisfactory organization, a reasonable, if modest, starting budget, and on the pressing problems deserving priority attention augurs well for the future.

Dr. A. Stampar (Yugoslavia) was elected president of the Assembly and three vice-presidents were chosen, one each from Brazil, Egypt and India. In addition to steering and credentials committees, the Assembly organized committees to deal with program, relations (with already existing bodies), headquarters and regionalization, administration and finance, and legal questions. An executive board consisting of a member from each of 18 countries with arrangement for rotation was accepted, and Dr. Brock Chisholm was elected director-general of the World Health Organization. Geneva was chosen for permanent headquarters.

The Committee on Regionalization divided the world into 6 areas: European, Eastern Mediterranean, South-East Asian, Western Pacific, African and North and South American. Each area will form, in due course, a regional committee with a regional office. For the Americas, the P.A.S.B. will fulfill this function when integrated.

The budget for 1949, set at five million dollars, was recognized as less than desirable and various activities had to be adjusted and curtailed. Top priority subjects to be taken up by the W.H.O. for its immediate program were malaria, venereal diseases, tuberculosis, maternal and child health, nutritional and environmental hygiene.

Neville M. Goodman, *Lancet*, 1948, 6520,
vol. CCLV: 265.





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Smallpox Diagnosis, with Special Reference to Electron Microscopy

C. E. van ROOYEN and G. D. SCOTT

Canada's National Health Program THE HONOURABLE PAUL MARTIN

Mumps Virus Antigens and Antisera

CHRISTINE E. RICE and R. V. L. WALKER

Teacher Workshop Techniques

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